

REMARKS

Reconsideration and withdrawal of the rejections set forth in the above-mentioned Official Action in view of the foregoing amendments and the following remarks are respectfully requested.

Claims 1-5 and 7-11 remain pending in the application, with Claims 1 and 11 being independent. Claims 1 and 11 have been amended herein.

Claims 1, 3, 4 and 7-11 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,448,269 (Beauchamp, et al.). Claim 2 was rejected under 35 U.S.C. § 103 as being unpatentable over Beauchamp, et al. in view of U.S. Patent No. 6,350,004 (Askren). Claim 5 was rejected under § 103 as being unpatentable over Beauchamp, et al. in view of U.S. Patent No. 6,227,644 (Perner). These rejections are respectfully traversed.

As is recited in independent Claim 1, the present invention relates to a printing apparatus for printing an image on a printing medium while relatively moving at least one of a printing head provided with an array of a plurality of printing elements and the printing medium. The apparatus includes a carriage mounting the printing head, and movable relative to the printing medium in a scanning direction crossing the array of the plurality of printing elements. The apparatus also includes detection means and control means. The detection means is mounted on the carriage and detects printing positions of an array of printed pixels corresponding to the array of the plurality of printing elements. The detecting means detects printed pixels printed by any of the plurality of printing elements. The control means controls drive timing of the plurality of printing elements

according to detection results of the detection means so as to make printing positions of subsequently printed pixels close to a predetermined center position. The control means controls the drive timing of the plurality of printing elements according to a difference in detection time, detected by the detection means, of printed pixels printed by at least two of the plurality of printing elements.

As is recited in independent Claim 11, the present invention relates to a printing method for printing an image on a printing medium while relatively moving at least one of a printing head provided with an array of a plurality of printing elements and the printing medium. The method includes the steps of relatively moving at least one of the printing head and the printing medium in a scanning direction crossing the array of the printing elements so that an array of printed pixels corresponding to the array of the printing elements is printed on the printing medium, detecting printing positions of the array of printed pixels by detecting printed pixels printed by any of the plurality of printing elements, and controlling drive timing of the plurality of printing elements according to detection results of the printing positions so as to make printing positions of subsequently printed pixels close to a predetermined center position. The controlling step controls drive timing of the plurality of printing elements according to a difference in detection time, detected in the detecting step, of printed pixels printed by at least two of the plurality of printing elements.

Beauchamp, et al. relates to an ink jet printer including a print head and an optical sensor for sensing a test pattern. At col. 8, lines 30-58, Beauchamp, et al. describes how images created by nozzles deviate from an ideal position due to print head speed and

platen curvature. These passages also discuss how to correct for such deviations due to speed and curvature. Each printing pen is caused to print a plurality of horizontally spaced vertical bars. The printed images are then scanned and the phase difference measured.

However, Applicants submit that Beauchamp, et al. does not disclose or suggest controlling drive timing of a plurality of printing elements according to a difference in detection time of printed pixels printed by at least two of a plurality of printing elements, as recited in independent Claims 1 and 11. Rather, in Beauchamp, et al. the drive timing of all of the printing elements is corrected according to the scanning speed of the carriage and the curvature of the platen.

Thus, Beauchamp, et al. fails to disclose or suggest important features of the present invention recited in independent Claims 1 and 11.

Askren relates to a method and apparatus for compensating for skew in an ink jet printer. As understood by Applicants, Askren corrects print positions of a plurality of printing elements arranged in an ink jet head to ideal positions. Perner relates to a printer that utilizes an image array 15 having two imaging detectors 16 for each nozzle. However, neither Askren nor Perner are believed to remedy the deficiencies of Beauchamp, et al. noted above with respect to independent Claims 1 and 11.

Thus, independent Claims 1 and 11 are patentable over the citations of record. Reconsideration and withdrawal of the §§ 102 and 103 rejections are respectfully requested.

For the foregoing reasons, Applicants respectfully submit that the present invention is patentably defined by independent Claims 1 and 11. Dependent Claims 2-5

and 7-10 are also allowable, in their own right, for defining features of the present invention in addition to those recited in their respective independent claims. Individual consideration of the dependent claims is requested.

This Amendment After Final Rejection is an earnest attempt to advance prosecution and reduce the number of issues, and is believed to clearly place this application in condition for allowance. This Amendment was not earlier presented because Applicants earnestly believed that the prior Amendment placed the subject application in condition for allowance. Accordingly, entry of this Amendment under 37 CFR 1.116 is respectfully requested.

Applicants submit that the present application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action, and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,


Attorney for Applicants

Registration No. 33,628

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200

MAW/agm/tnt
DC_MAIN 105742 v 1



VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. (Twice Amended) A printing apparatus for printing an image on a printing medium while relatively moving at least one of a printing head provided with an array of a plurality of printing elements and the printing medium, said apparatus comprising:

a carriage mounting said printing head, and movable relative to the printing medium in a scanning direction crossing said array of said plurality of printing elements;

detection means mounted on said carriage for detecting printing positions of an array of printed pixels corresponding to said array of said plurality of printing elements, said detecting means detecting printed pixels printed by any of said plurality of printing elements; and

control means for controlling drive timing of said plurality of printing elements according to detection results of said detection means so as to make printing positions of subsequently printed pixels close to a predetermined center position, said control means controlling the drive timing of said plurality of printing elements according to a difference in detection time, detected by said detection means, of printed pixels printed by at least two of said plurality of printing elements.

11. (Twice Amended) A printing method for printing an image on a printing medium while relatively moving at least one of a printing head provided with an array of a plurality of printing elements and the printing medium, comprising the steps of:

relatively moving at least one of the printing head and the printing medium in a scanning direction crossing the array of the printing elements so that an array of printed pixels corresponding to the array of the printing elements is printed on the printing medium;

detecting printing positions of the array of printed pixels by detecting printed pixels printed by any of the plurality of printing elements; and

controlling drive timing of the plurality of printing elements according to detection results of the printing positions so as to make printing positions of subsequently printed pixels close to a predetermined center position, wherein said controlling step controls drive timing of the plurality of printing elements according to a difference in detection time, detected in said detecting step, of printed pixels printed by at least two of the plurality of printing elements.